Quick survey:

1. In class we keep referring to quantum gates as "unitary operators", or just "unitaries". First of all, what is a unitary, and what are its most important properties?

2. Why are unitaries important in quantum mechanics? To start you off, what does a unitary operation do to the information we have about a quantum system? What kind of a *physical* operation does a unitary correspond to?

3. Come up with at least one kind of operation in quantum mechanics which is *not* unitary. What does this do to the information we have about the system? What does it physically do to the system itself?

4. Why do you think we are so obsessed about having quantum gates in quantum computing circuits be unitary? Do you think it is absolutely necessary for them to be?